

## SCOPE AND SEQUENCE

This is one model of a curriculum scope and sequence. School district personnel are encouraged to adapt it as necessary in order to better meet the needs of their students. The Expectations described in Strand 7: Inquiry and Strand 8: Science/Technology/Human Activity should be made a priority and integrated throughout every teaching unit in each of the other strands. Grade-span assessments will be administered in Science at grades 5, 8, and 11 no later than the 2007-2008 school year.

	Kindergarten	First	Second	Third	Fourth	Fifth	Sixth	Seventh	Eighth	9, 10, 11
<b>Strand 1 Matter &amp; Energy</b>	Properties of Matter Investigating Sound	Properties of Matter: Mass and Temperature	(Properties of Rocks & Soil)  Forms of Energy: Sound	Investigating States of Matter  (Earth/Sun/ and Moon)	Mixtures and Solutions  Forms of Energy: Electrical Circuits		Properties of and Changes in Matter  Forms of Energy: Light and Sound	Forms of Energy: Heat, Electricity and Magnetism  Energy Transformations	Physical and Chemical Properties and Changes of Matter	Atomic Theory and Changes in Matter  Energy Forms and Transfer
<b>Strand 2 Force &amp; Motion</b>	Change in Position	Investigating Motion	Forces and Motion		Laws of Motion	Work and Simple machines		Force, Motion and Work		Interactions between Energy, Force, and Motion
<b>Strand 3 Living Organisms</b>	Plants & Animals  Parent-Offspring Relationships	Characteristics of Plants and Animals	Life Cycles of Animals	Plants		Classification of Plants and Animals	Characteristics of Living Organisms		Cells and Body Systems  Disease Reproduction and Heredity	Diversity and Unity Among Organisms  Cellular Processes  Genetics and Heredity
<b>Strand 4 Ecology</b>	(Weather & Seasons)			Food Chains	Interactions among Organisms and Their Environments		Ecosystems and Populations			Interdependence of Organisms and their Environment  Matter and Energy in the Ecosystem  Biological Evolution
<b>Strand 5 Earth Systems</b>	Weather and Seasons	Observing Water & Weather	Earth Materials: Rocks & Soil	(Investigating States of Matter)	Changes in the Earth's Surface	Water Cycle and Weather	Internal Processes and External Events Earth's Resources	Weather and Climate	Rock Cycle & Plate Tectonics	Components and Structure of Earth's Systems  Interactions among Earth's Systems and Processes of Change  Effect of Human Activity on Earth's Resources
<b>Strand 6 Universe</b>	Objects in the Sky			Earth, Sun, and Moon		Solar System		Objects and their Motion in the Solar System		Objects in the Universe and their Motion
<b>Strand 7 Scientific Inquiry</b>	Inquiry	Inquiry	Inquiry	Inquiry	Inquiry	Inquiry	Inquiry	Inquiry	Inquiry	Inquiry
<b>Strand 8 Science/ Technology/ &amp; Human Activity</b>	Sci/Tech/ Human Activity	Sci/Tech/ Human Activity	Sci/Tech/ Human Activity	Sci/Tech/ Human Activity	Sci/Tech/ Human Activity	Sci/Tech/ Human Activity	Sci/Tech/ Human Activity	Sci/Tech/ Human Activity	Sci/Tech/ Human Activity	Sci/Tech/ Human Activity

## Standard 1: Properties and Principles of Matter and Energy

1. Changes in properties and states of matter provide evidence of the atomic theory of matter			
Concept	Kindergarten	Grade 1	Grade 2
<b>A.</b> <b>Objects, and the materials they are made of, have properties that can be used to describe and classify them</b>	<i>Scope and Sequence – Properties of Matter</i> a. Describe physical properties of objects (i.e., size, shape, color, and mass) by using the senses, simple tools (e.g., magnifiers, equal arm balances), and/or nonstandard measures (e.g., bigger/smaller; more/less) b. Identify materials (i.e., cloth, paper, wood, rock, metal) that make up an object, and some of the physical properties of the materials (e.g., color, texture, shiny/dull, odor, sound, taste, flexibility) c. Sort objects based on observable physical properties (e.g., size, material, color, shape, and mass)	<i>Scope and Sequence – Properties of Matter: Mass &amp; Temperature</i> a. Given an equal-arm balance and various objects, illustrate arrangements in which the beam is balanced b. Measure and compare the mass of objects (more/less) c. Order objects according to mass	<i>Scope and Sequence – Properties of Rocks and Soil</i> a. Describe and compare the physical properties of objects by using simple tools (i.e. thermometer, magnifier, centimeter ruler, balance, magnet) b. Classify objects as “one kind of material” or a mixture
ST			
<b>B.</b> <b>Properties of mixtures depend upon the concentrations, properties and interactions of particles</b>			<i>Scope and Sequence – Properties of Rocks and Soil</i> a. Observe and describe how mixtures are made by combining solids b. Describe ways to separate the components of a mixture by their physical properties (i.e., sorting, magnets or screening)
ST			
<b>C.</b> <b>Properties of matter can be explained in terms of moving particles too small to be seen without tremendous magnification</b>	Not assessed at this level		
<b>D.</b> <b>Physical changes in the state of matter that result from thermal changes can be explained by moving particles (The kinetic theory of matter)</b>	Not assessed at this level		
<b>E.</b> <b>The atomic model describes the electrically neutral atom</b>	Not assessed at this level		

## Standard 1: Properties and Principles of Matter and Energy

1. Changes in properties and states of matter provide evidence of the atomic theory of matter			
Concept	Kindergarten	Grade 1	Grade 2
F. The periodic table organizes the elements according to their atomic structure and chemical reactivity		Not assessed at this level	
G. Properties of objects and states of matter can change chemically and/or physically		Not assessed at this level	
H. Chemical bonding is the combining of different pure substances (elements, compounds) to form new substances with different properties		Not assessed at this level	
I. Mass is conserved during any physical or chemical change		Not assessed at this level	

## Standard 1: Properties and Principles of Matter and Energy

2. Energy has a source, can be transferred, and transformed into various forms but is conserved between and within systems			
Concept	Kindergarten	Grade 1	Grade 2
<b>A.</b> <b>Forms of energy have a source, a means of transfer (work and heat) and a receiver</b>	<i>Scope and Sequence – Investigating Sound</i> a. Identify the sounds and their source of vibrations in our everyday life (e.g. alarms, car horns, animals, machines, musical instruments) b. Compare different sounds (i.e., loudness, pitch, rhythm) c. Recognize that the ear serves as a receiver of sound	<i>Scope and Sequence – Properties of Matter: Mass &amp; Temperature</i> a. Identify the source of energy that causes an increase in the temperature of an object (e.g. sun, stove, flame, light bulb) b. Compare the temperature of how hot or cold an object is using a simple thermometer c. Describe the change in temperature of an object as warmer or cooler	<i>Scope and Sequence – Forms of Energy: Sound</i> a. Recognize that sound travels through different mediums (i.e., air, water, solids) b. Describe different ways to change the pitch of a sound (i.e., changes in size such as length or thickness and in tightness/tension of the source) c. Describe how the ear serves as a receiver of sound (i.e., sound vibrates eardrum)
ST			
<b>B.</b> <b>Mechanical energy comes from the motion (kinetic energy) and/or position (potential energy) of an object</b>	Not assessed at this level		
<b>C.</b> <b>Electromagnetic energy from the sun (solar radiation) is a major source of energy on Earth</b>		<i>Scope and Sequence – Characteristics of Plants and Animals</i> a. Identify light from the sun as a basic need of most plants	
ST			
<b>D.</b> <b>Chemical reactions involve changes in the bonding of atoms with the release or absorption of energy</b>	Not assessed at this level		

## Standard 1: Properties and Principles of Matter and Energy

2. Energy has a source, can be transferred, and transformed into various forms but is conserved between and within systems			
Concept	Kindergarten	Grade 1	Grade 2
E. Nuclear energy is a major source of energy throughout the universe	Not assessed at this level		
F. Energy can change from one form to another within systems but the total amount remains the same	Not assessed at this level		

## Standard 1: Properties and Principles of Matter and Energy

1. Changes in properties and states of matter provide evidence of the atomic theory of matter			
Concept	Grade 3	Grade 4	Grade 5
<b>A.</b> <b>Objects, and the materials they are made of, have properties that can be used to describe and classify them</b>		<i>Scope and Sequence – Mixtures and Solutions</i> a. Describe and compare the masses of objects to the nearest gram by using balances b. Describe and compare the volumes (the amount of space an object takes up) of objects using a graduated cylinder c. Recognize that no two objects can occupy the same space at the same time (e.g., water level rises when an object or substance such as a rock is placed in a quantity of water) d. Classify types of materials (e.g., water, salt, sugar, iron filings, salt water) as substances (materials that have specific physical properties) or mixtures of substances by using their characteristic properties	
ST			
<b>B.</b> <b>Properties of mixtures depend upon the concentrations, properties and interactions of particles</b>		<i>Scope and Sequence – Mixtures and Solutions/ Changes on the Earth's Surface</i> a. Identify water as a solvent that dissolves some materials (Do NOT assess the term solvent) b. Observe and describe how mixtures are made by combining solids or liquids, or a combination of these c. Distinguish between the components in a mixture (e.g. trail mix, conglomerate rock, salad) d. Describe ways to separate the components of a mixture by their properties (i.e., sorting, filtration, magnets, or screening)	
ST			
<b>C.</b> <b>Properties of matter can be explained in terms of moving particles too small to be seen without tremendous magnification</b>			<i>Scope and Sequence – Water cycle &amp; Weather</i> a. Recognize how changes in state (i.e., freezing/melting, condensation/evaporation) provide evidence that matter is made of particles too small to be seen
ST			

## Standard 1: Properties and Principles of Matter and Energy

1. Changes in properties and states of matter provide evidence of the atomic theory of matter			
Concept	Grade 3	Grade 4	Grade 5
<b>D.</b> <b>Physical changes in states of matter due to thermal changes in materials can be explained by moving particles too small to be seen (The kinetic theory of matter)</b>	<i>Scope and Sequence – Investigating States of Matter</i> a. Compare the observable physical properties of solids, liquids, or gases (air) (i.e. visible vs. invisible, changes in shape, and changes in the amount of space occupied) b. Identify everyday objects/substances as solid, liquid or gas (e.g., air, water) c. Recognize that water evaporates (liquid water changes into a gas as it moves into the air) d. Measure and compare the temperature of water when it exists as a solid to its temperature when it exists as a liquid (cold vs. warmer) e. Investigate and recognize that water can change from a liquid to a solid (freeze) and back again to a liquid (melt) as the result of temperature changes f. Describe the changes in the physical properties of water (i.e., shape, volume) when frozen or melted g. Predict and investigate the effect of heat energy (i.e., change in temperature, melting, evaporation) on objects and materials		<i>Scope and Sequence – Water cycle &amp; Weather</i> a. Classify matter as a solid, a liquid, or a gas as it exists at room temperature using physical properties (i.e., volume, shape, ability to flow) b. Predict the effect of heat energy on the physical properties of water as it changes to and from a solid, liquid, or gas (i.e., freezing/melting, evaporation/condensation)
ST			
<b>E.</b> <b>The atomic model describes the electrically neutral atom</b>	Not assessed at this level		
<b>F.</b> <b>The periodic table organizes the elements according to their atomic structure and chemical reactivity</b>	Not assessed at this level		
<b>G.</b> <b>Properties of objects and states of matter can change chemically and/or physically</b>	Not assessed at this level		

## Standard 1: Properties and Principles of Matter and Energy

1. Changes in properties and states of matter provide evidence of the atomic theory of matter			
Concept	Grade 3	Grade 4	Grade 5
H. Chemical bonding is the combining of different pure substances (elements, compounds) to form new substances with different properties.	Not assessed at this level		
I. Mass is conserved during any physical or chemical change		<i>Scope and Sequence – Mixtures and Solutions</i> a. Recognize that the total mass of a material remains constant whether it is together, in parts, or in a different state.	<i>Scope and Sequence – Water Cycle and Weather</i> a. Recognize that the mass of water remains constant as it changes state (as evidenced in a closed container)
ST			



## Standard 1: Properties and Principles of Matter and Energy

2. Energy has a source, can be transferred, and transformed into various forms but is conserved between and within systems			
Concept	Grade 3	Grade 4	Grade 5
<b>A.</b> <b>Forms of energy have a source, a means of transfer (work and heat) and a receiver</b>	<i>Scope and Sequence – Investigating States of Matter</i> a. Identify sources of thermal energy (e.g., sun, stove, fire, body) that can cause solids to change to liquids and liquids to change to gas  <i>Scope and Sequence – Earth/Sun/and Moon</i> b. Identify sources of light energy (e.g., sun, bulbs, flames) c. Recognize that light can be transferred from the source to the receiver (eye) through space d. Identify the three things (light source, object, and surface) necessary to produce a shadow	<i>Scope and Sequence – Forms of Energy: Electrical Circuits</i> a. Construct and diagram a complete electric circuit by using a source (e.g., battery), a means of transfer (e.g., wires), and a receiver (e.g., resistance bulbs, motors, fans) b. Observe and describe the evidence of energy transfer in a closed series circuit (e.g., lit bulb, moving motor or fan) c. Classify materials as conductors or insulators of electricity when placed within a circuit (e.g. wood, pencil lead, plastic, glass, aluminum foil, lemon juice, air, water)	<i>Scope and Sequence – Solar System</i> a. Recognize that light can be transferred from the source to the receiver (eye) through space in straight lines b. Recognize how an object (e.g., moon, mirror, objects in a room) can only be seen when light is reflected from that object to the receiver (eye)
ST			
<b>B.</b> <b>Mechanical energy comes from the motion (kinetic energy) and/or position (potential energy) of an object</b>	Not assessed at this level		
<b>C.</b> <b>Electromagnetic energy from the sun (solar radiation) is a major source of energy on Earth</b>	<i>Scope and Sequence – Earth, Sun, and Moon/Food Chains</i> a. Recognize that the sun is the primary source of light and food energy on Earth		<i>Scope and Sequence – Water Cycle and Weather</i> a. Recognize the sun as the primary source of energy for temperature change on Earth
ST			
<b>D.</b> <b>Chemical reactions involve changes in the bonding of atoms with the release or absorption of energy</b>	Not assessed at this level		

## Standard 1: Properties and Principles of Matter and Energy

2. Energy has a source, can be transferred, and transformed into various forms but is conserved between and within systems			
Concept	Grade 3	Grade 4	Grade 5
E. Nuclear energy is a major source of energy throughout the universe	Not assessed at this level		
F. Energy can change from one form to another within systems but the total amount remains the same		<i>Scope and Sequence – Forms of Energy: Electrical Circuits</i> a. Identify the evidence of energy transformations (temperature change, light, sound, motion, and magnetic effects) that occur in electrical circuits	
ST			

## Standard 1: Properties and Principles of Matter and Energy

1. Changes in properties and states of matter provide evidence of the atomic theory of matter			
Concept	Grade 6	Grade 7	Grade 8
<b>A.</b> <b>Objects, and the materials they are made of, have properties that can be used to describe and classify them</b>	<i>Scope and Sequence – Properties of and Changes in Matter</i> a. Recognize that matter is anything that has mass and volume b. Describe and compare the volumes (the amount of space an object takes up) of objects or substances directly using a graduated cylinder and/or indirectly using displacement methods c. Describe and compare the masses (amount of matter) of objects to the nearest gram using a balance d. Classify the types of matter in an object into pure substances or mixtures using their specific physical properties		<i>Scope and Sequence – Physical and Chemical Properties and Changes of Matter</i> a. Recognize that elements (unique atoms) and compounds (molecules or crystals) are pure substances that have characteristic properties b. Describe the physical and chemical properties (e.g. magnetic attraction, conductivity, melting point and boiling point, reactivity) of pure substances (elements or compounds) (e.g. copper wire, aluminum wire, iron, charcoal, sulfur, water, salt, sugar, sodium bicarbonate, galena, quartz, magnetite, pyrite) using appropriate senses and tools
ST			
<b>B.</b> <b>Properties of mixtures depend upon the concentrations, properties and interactions of particles</b>	<i>Scope and Sequence – Properties of and Changes in Matter</i> a. Describe the properties of each component in a mixture/solution and their distinguishing properties (e.g. salt water, oil and vinegar, pond water, Kool-Aid) b. Describe appropriate ways to separate the components of different types of mixtures, (sorting, evaporation, filtration, magnets, boiling, chromatography or screening) c. Predict how various solids (soluble/insoluble) behave (e.g. dissolve, settle, float) when mixed with water		
ST			
<b>C.</b> <b>Properties of matter can be explained in terms of moving particles too small to be seen without tremendous magnification</b>	<i>Scope and Sequence – Properties of and Changes in Matter</i> a. Recognize evidence (e.g., diffusion of food coloring in water, light reflecting off of dust particles in the air, condensation of water vapor by increased pressure or decreased temperature) that supports the theory that matter is composed of small particles (atoms, molecules) that are in constant, random motion		<i>Scope and Sequence – Physical and Chemical Properties and Changes of Matter</i> a. Describe evidence (e.g., diffusion of colored material into clear material such as water; light reflecting off of dust particles in air; changes in physical properties and reactivity such as gold hammered into foil, oil spreading on the surface of water, decay of organic matter, condensation of water vapor by increased pressure) that supports the theory that matter is composed of moving particles too small to be seen (atoms, molecules)
ST			

## Standard 1: Properties and Principles of Matter and Energy

1. Changes in properties and states of matter provide evidence of the atomic theory of matter			
Concept	Grade 6	Grade 7	Grade 8
<b>D.</b> <b>Physical changes in the state of matter that result from thermal changes can be explained by moving particles (The kinetic theory of matter)</b>	<i>Scope and Sequence – Earth's Resources</i> a. Describe the relationship between the change in the volume of water and changes in temperature as it relates to the properties of water (i.e., water expands and becomes less dense when frozen)	<i>Scope and Sequence – Weather &amp; Climate</i> a. Describe the relationship between temperature and the movement of atmospheric gases (i.e., warm air rises due to expansion of the volume of gas, cool air sinks due to contraction of the volume of gas)	<i>Scope and Sequence – Physical and Chemical Properties and Changes of Matter</i> a. Using the kinetic theory model, illustrate and account for the physical properties (i.e., shape, volume, malleability, and viscosity) of a solid, liquid, or gas in terms of the arrangement and motion of molecules in a substance b. Use the kinetic theory model to explain changes in the volume, shape, and viscosity of materials in response to temperature changes during a phase change c. Predict the effect of transfer on the physical properties of a substance as it changes to or from a solid, liquid, or gas (i.e., phase changes that occur during freezing, melting, evaporation, boiling, condensation)
ST			
<b>E.</b> <b>The atomic model describes the electrically neutral atom</b>	Not assessed at this level		
<b>F.</b> <b>The periodic table organizes the elements according to their atomic structure and chemical reactivity</b>			<i>Scope and Sequence – Physical and Chemical Properties and Changes of Matter</i> a. Recognize that more than 100 known elements (unique atoms) exist that may be combined in nature or by man to produce compounds that make up the living and nonliving substances in the environment (Do not assess memorization of Periodic Table)
ST			

## Standard 1: Properties and Principles of Matter and Energy

1. Changes in properties and states of matter provide evidence of the atomic theory of matter			
Concept	Grade 6	Grade 7	Grade 8
<b>G.</b> <b>Properties of objects and states of matter can change chemically and/or physically</b>	<i>Scope and Sequence – Properties of and Changes in Matter</i> a. Recognize and classify changes in matter as chemical and/or physical b. Identify chemical changes (i.e. rusting, oxidation, burning, decomposition by acids, decaying, baking) in common objects (i.e. rocks such as limestone, minerals, wood, steel wool, plants) as a result of interactions with sources of energy or other matter that form new substances with different characteristic properties c. Identify physical changes in common objects (e.g. rocks, minerals, wood, water, steel wool, plants) and describe the processes which caused the change (e.g. weathering, erosion, cutting, dissolving)		
ST			
<b>H.</b> <b>Chemical bonding is the combining of different pure substances (elements, compounds) to form new substances with different properties.</b>	Not assessed at this level		
<b>I.</b> <b>Mass is conserved during any physical or chemical change</b>	<i>Scope and Sequence – Properties of and Changes in Matter</i> a. Demonstrate and provide evidence that mass is conserved during a physical change	<i>Scope and Sequence – Weather and Climate</i> a. Explain that the amount of matter remains constant while being recycled through the water cycle	<i>Scope and Sequence – Physical and Chemical Properties and Changes of Matter</i> a. Provide evidence that mass is conserved during a chemical change in a closed system (e.g. vinegar + baking soda, mold growing in a closed container, steel wool rusting)  <i>Scope and Sequence – Rock Cycle and Plate Tectonics</i> b. Explain that the amount of matter remains constant while being recycled through the rock cycle  <i>Scope and Sequence – Cells and Body Systems</i> c. Explain that the amount of matter remains constant while being recycled through food chains and food webs
ST			

## Standard 1: Properties and Principles of Matter and Energy

### 2. Energy has a source, can be transferred, and transformed into various forms but is conserved between and within systems.

Concept	Grade 6	Grade 7	Grade 8
<p><b>A.</b> <b>Forms of energy have a source, a means of transfer (work and heat) and a receiver</b></p>	<p><i>Scope and Sequence -- Forms of Energy: Light</i></p> <ol style="list-style-type: none"> <li>Identify sources of visible light (e.g., the sun and other stars, flint, bulb, flames, lightning)</li> <li>Describe evidence (i.e., cannot bend around walls) that visible light travels in a straight line using the appropriate tools (i.e., pinhole viewer, ray box and/or laser pointer)</li> <li>Compare the reflection of visible light by various surfaces (i.e. mirror, smooth and rough surfaces, shiny and dull surfaces, moon)</li> <li>Compare the refraction of visible light passing through different transparent and translucent materials (e.g. prisms, water, a lens)</li> <li>Predict how visible light behaves (reflects, refracts, absorbs, transmits) when it interacts with different surfaces (transparent, translucent, opaque)</li> <li>Identify receivers of visible light energy (e.g., eye, photocell)</li> <li>Recognize that an object is "seen" only when the object emits or reflects light to the eye</li> <li>Recognize that differences in wavelength within that range of visible light that can be seen by the human eye are perceived as differences in color</li> </ol> <p><i>Scope and Sequence -- Forms of Energy: Sound</i></p> <ol style="list-style-type: none"> <li>Describe how sound energy is transferred by wave-like disturbances that spread away from the source through a medium</li> <li>Predict how the properties of the medium (e.g., air, water, empty space, rock) affect the speed of different types of mechanical waves (i.e., earthquake, sound)</li> </ol>	<p><i>Scope and Sequence -- Forms of Energy: Heat</i></p> <ol style="list-style-type: none"> <li>Recognize thermal energy as the random motion (kinetic energy) of molecules or atoms within a substance</li> <li>Use the molecular kinetic model to explain changes in the temperature of a material</li> <li>Recognize that thermal energy is transferred as heat from warmer objects to cooler objects until both reach the same temperature</li> <li>Recognize the type of materials that transfer energy by conduction, convection, and radiation</li> <li>Describe how heat is transferred by conduction, convection, and radiation and classify examples of each</li> <li>Classify common materials (e.g. wood, foam, plastic, glass, aluminum foil, soil, air, water) as conductors or insulators of thermal energy</li> <li>Predict the differences in temperature over time on different colored (black and white) objects absorb and emit radiant energy</li> </ol> <p><i>Scope and Sequence -- Forms of Energy: Electricity and Magnetism</i></p> <ol style="list-style-type: none"> <li>Describe the interactions (i.e., repel, attract) of like and unlike charges (i.e., magnetic, static electric, electrical)</li> <li>Diagram and identify a complete electric circuit by using a source (battery), a means of transfer (wires), and a receiver (resistance bulbs, motors, fans)</li> <li>Observe and describe the evidence of energy transfer in a closed series circuit</li> <li>Describe the effects of resistance (number of receivers), amount of voltage (number of energy sources), and kind of transfer materials on the current being transferred through a circuit (e.g., brightness of light, speed of motor)</li> <li>Classify materials as conductors or insulators of electricity when placed within a circuit (e.g. wood, pencil lead, plastic, glass, aluminum foil, lemon juice, air, water)</li> <li>Diagram and distinguish between complete series and parallel circuits</li> <li>Identify advantages and disadvantages of series and parallel circuits</li> </ol>	<p><i>Scope and Sequence -- Physical and Chemical Properties and Changes of Matter</i></p> <ol style="list-style-type: none"> <li>Recognize examples of chemical energy that is stored in chemical compounds (e.g., energy stored in and released from food molecules, batteries, nitrogen explosives, fireworks, organic fuels)</li> </ol>
ST			

## Standard 1: Properties and Principles of Matter and Energy

2. Energy has a source, can be transferred, and transformed into various forms but is conserved between and within systems			
Concept	Grade 6	Grade 7	Grade 8
<b>B.</b> Mechanical energy comes from the motion (kinetic energy) and/or position (potential energy) of an object	Not assessed at this level		
<b>C.</b> Electromagnetic energy from the sun (solar radiation) is a major source of energy on Earth	<i>Scope and Sequence -- Forms of Energy: Light</i> a. Recognize that the energy from the Sun is transferred to Earth in a range of wavelengths including visible light, infrared radiation, and ultraviolet radiation  <i>Scope and Sequence -- Characteristics of Living Organisms</i> b. Recognize that the sun is the source of almost all energy used to produce the food for living organisms	<i>Scope and Sequence -- Weather &amp; Climate</i> a. Identify solar radiation as the primary source of energy for weather phenomena	
ST			
<b>D.</b> Chemical reactions involve changes in the bonding of atoms with the release or absorption of energy	Not assessed at this level		
<b>E.</b> Nuclear energy is a major source of energy throughout the universe	Not assessed at this level		
<b>F.</b> Energy can change from one form to another within systems but the total amount remains the same		<i>Scope and Sequence -- Energy Transformations</i> a. Identify the different energy transformations that occur between different systems (e.g. chemical energy in battery converted to electricity in circuit converted to light and heat from a bulb) b. Recognize that, during an energy transformation, heat is often transferred from one object (system) to another because of a difference in temperature c. Recognize that energy is not lost but conserved as it is transferred and transformed	<i>Scope and Sequence -- Physical and Chemical Properties and Changes of Matter</i> a. Identify the evidence of different energy transformations (e.g., explosion of light, heat, and sound, temperature change, electrical charge) that may occur as chemical energy is released during a chemical reaction
T			

## Standard 1: Properties and Principles of Matter and Energy

1. Changes in properties and states of matter provide evidence of the atomic theory of matter	
Concept	Grade 9, 10, 11
<b>A.</b> <b>Objects, and the materials they are made of, have properties that can be used to describe and classify them</b>	<i>Scope and Sequence – Atomic Theory and Changes in Matter</i> a. Measure the volume and mass of regular and irregular objects and calculate their respective densities b. Identify pure substances by their physical and chemical properties (i.e. color, luster/reflectivity, hardness, conductivity, density, pH, melting point, boiling point, specific heat, solubility, phase at room temperature, chemical reactivity) c. Classify a substance as being made up of one kind of atom (element) or a compound when given the molecular formula or structural formula (or electron dot diagram) for the substance
ST	
<b>B.</b> <b>Properties of mixtures depend upon the concentrations, properties and interactions of particles</b>	<i>Scope and Sequence – Atomic Theory and Changes in Matter</i> a. Classify solutions as dilute, concentrated, saturated b. Compare and contrast the properties of acidic, basic and neutral solutions c. Predict the effect of the properties of the solvent or solute (e.g. polarity, temperature, surface area/particle size, concentration, agitation) on the solubility of a substance
ST	
<b>C.</b> <b>Properties of matter can be explained in terms of moving particles too small to be seen without tremendous magnification</b>	Not assessed at this level
<b>D.</b> <b>Physical changes in states of matter due to thermal changes in materials can be explained by moving particles (The kinetic theory of matter)</b>	<i>Scope and Sequence – Atomic Theory and Changes in Matter</i> a. Using the kinetic theory model, explain the changes that occur in the distance between atoms/molecules and temperature of a substance as energy is absorbed or released during a phase change b. Predict the effect of a temperature change on the properties (e.g., pressure, density) of a material (solids, liquids, and gases) c. Predict the effect of pressure changes on the properties (e.g., temperature, density) of a material (solids, liquids, and gases)
ST	
<b>E.</b> <b>The atomic model describes the electrically neutral atom</b>	<i>Scope and Sequence – Atomic Theory and Changes in Matter</i> a. Describe the atom as having a dense, positive nucleus surrounded by a cloud of negative electrons b. Calculate the number of protons, neutrons, and electrons of an element (or isotopes) given its atomic mass (or mass number) and atomic number c. Describe the information provided by the atomic number and the mass number (i.e. electrical charge, chemical stability)
ST	



## Standard 1: Properties and Principles of Matter and Energy

1. Changes in properties and states of matter provide evidence of the atomic theory of matter	
Concept	Grade 9, 10, 11
<b>F.</b> <b>The periodic table organizes the elements according to their atomic structure and chemical reactivity</b>	<i>Scope and Sequence – Atomic Theory and Changes in Matter</i> a. Explain the structure of the periodic table in terms of the elements with common properties (groups/families) and repeating properties (periods) b. Compare and contrast the common properties of metals, nonmetals, metalloids, and noble gases and their location on the periodic table c. Predict the properties of elements and the bonds that may result between elements using the periodic table
ST	
<b>G.</b> <b>Properties of objects and states of matter can change chemically and/or physically</b>	<i>Scope and Sequence – Atomic Theory and Changes in Matter</i> a. Distinguish between physical and chemical changes in matter
ST	
<b>H.</b> <b>Chemical bonding is the combining of different pure substances (elements, compounds) to form new substances with different properties</b>	<i>Scope and Sequence – Atomic Theory and Changes in Matter</i> a. Describe how the valence electron configuration determines how atoms interact and may bond b. Predict the reaction rates of different substances based on their properties (i.e., concentrations of reactants, pressure, temperature, state of matter, surface area, type of reactant material) c. Compare and contrast the types of chemical bonds (i.e., ionic, covalent) d. Identify the consequences of different types of reactions (i.e., oxidation/reduction reactions such as combustion, acid/base reactions) to humans and human activity
ST	
<b>I.</b> <b>Mass is conserved during any physical or chemical change</b>	<i>Scope and Sequence – Atomic Theory and Changes in Matter</i> a. Compare the mass of the reactants to the mass of the products in a chemical reaction or physical change as support for the Law of Conservation of Mass b. Recognize whether the number of atoms of the reactants and products in a chemical equation are balanced
ST	

## Standard 1: Properties and Principles of Matter and Energy

2. Energy has a source, can be transferred, and transformed into various forms but is conserved between and within systems	
Concept	Grade 9, 10, 11
<b>A.</b> <b>Forms of energy have a source, a means of transfer (work and heat) and a receiver</b>	<i>Scope and Sequence – Energy Forms and Transfer</i> a. Differentiate between thermal energy (the total internal energy of a substance which is dependent upon mass), heat (thermal energy that transfers from one object or system to another due to a difference in temperature), and temperature (the measure of average kinetic energy of molecules or atoms in a substance) b. Recognize chemical energy as the energy stored in the bonds between atoms in a compound c. Describe the relationship among wavelength, energy, and frequency as illustrated by the electromagnetic spectrum d. Describe sources and common uses of different forms of energy (i.e., chemical, nuclear, thermal, mechanical, electromagnetic) e. Identify and evaluate advantages/disadvantages of using various sources of energy (e.g., wind, solar, geothermal, hydroelectric, biomass, fossil fuel) for human activity f. Describe the effect of different frequencies of electromagnetic waves on the Earth and living organisms (e.g. radio, infrared, visible, ultraviolet, gamma, and cosmic rays) g. Interpret examples (e.g., land and sea breezes, home heating, plate tectonics) of heat transfer as convection, conduction or radiation
ST	
<b>B.</b> <b>Mechanical energy comes from the motion (kinetic energy) and/or position (potential energy) of an object</b>	<i>Scope and Sequence – Interactions between Energy, Force, and Motion</i> a. Relate kinetic energy to an object's mass and its velocity b. Relate an object's gravitational potential energy to its weight and height relative to the surface of the Earth c. Distinguish between examples of kinetic and potential energy (i.e., gravitational, elastic) within a system
ST	
<b>C.</b> <b>Electromagnetic energy from the sun (solar radiation) is a major source of energy on Earth</b>	<i>Scope and Sequence – Energy Forms and Transfer (Objects in the Universe and their Motion)</i> a. Identify stars as producers of electromagnetic energy b. Describe how electromagnetic energy is transferred through space as electromagnetic waves (radiation)
ST	
<b>D.</b> <b>Chemical reactions involve changes in the bonding of atoms with the release or absorption of energy</b>	<i>Scope and Sequence – Energy Forms and Transfer (Atomic Theory and Changes in Matter)</i> a. Describe evidence of energy transfer and transformations that occur during exothermic and endothermic chemical reactions
ST	
<b>E.</b> <b>Nuclear energy is a major source of energy throughout the universe</b>	<i>Scope and Sequence – Energy Forms and Transfer</i> a. Describe how changes in the nucleus of an atom during a nuclear reaction (i.e., nuclear decay, fusion, fission) result in emission of radiation b. Identify the role of nuclear energy as it serves as a source of energy for the Earth, stars, and human activity (e.g., source of electromagnetic radiation, thermal energy within mantle, nuclear power plants, fuel for stars)
ST	

## Standard 1: Properties and Principles of Matter and Energy

### 2. Energy has a source, can be transferred, and transformed into various forms but is conserved between and within systems

Concept	Grade 9, 10, 11
<p><b>F.</b>  <b>Energy can change from one form to another within and between systems but the total amount remains the same</b></p>	<p><i>Scope and Sequence – Energy Forms and Transfer</i></p> <ol style="list-style-type: none"> <li>Describe the transformations that occur as energy changes from kinetic to potential within a system (e.g., car moving on rollercoaster track, child swinging, diver jumping off a board) (Do NOT assess calculations)</li> <li>Compare the efficiency of simple machines (recognizing that, as work is done, the amount of usable energy decreases with each transformation as it is transferred as heat due to friction)</li> <li>Classify the different forms of energy (i.e., chemical, nuclear, thermal, mechanical, electromagnetic) that can be observed as energy is transferred and transformed within a system when given a scenario (e.g., dynamite explosion, solar radiation interacting with the Earth, electromagnetic motor doing work, energy generated by nuclear reactor)</li> <li>Explain how energy can be transferred (absorbed or released) or transformed between and within systems as the total amount of energy remains constant (i.e., Law of Conservation of Energy)</li> </ol>
ST	